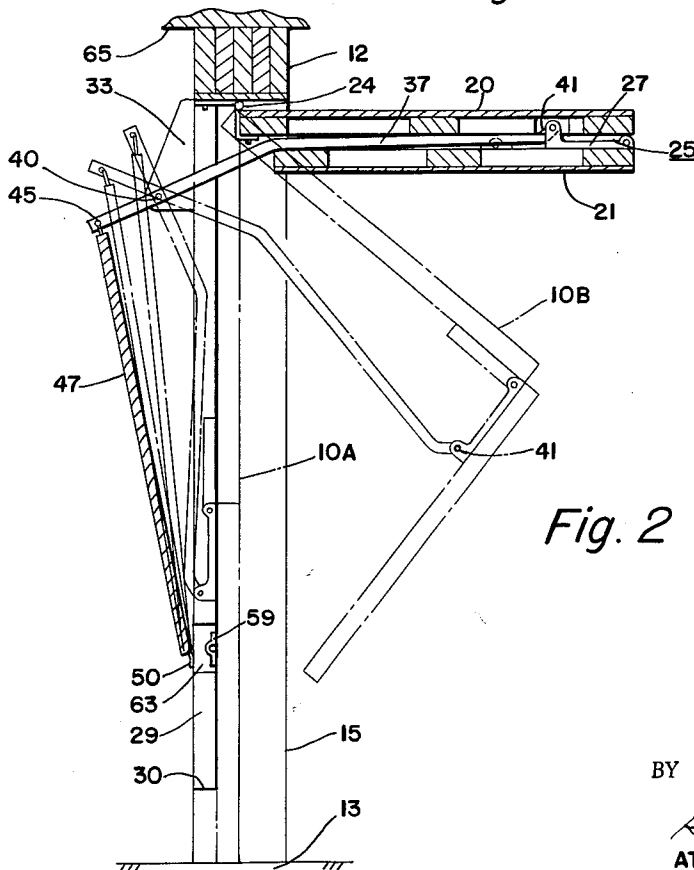
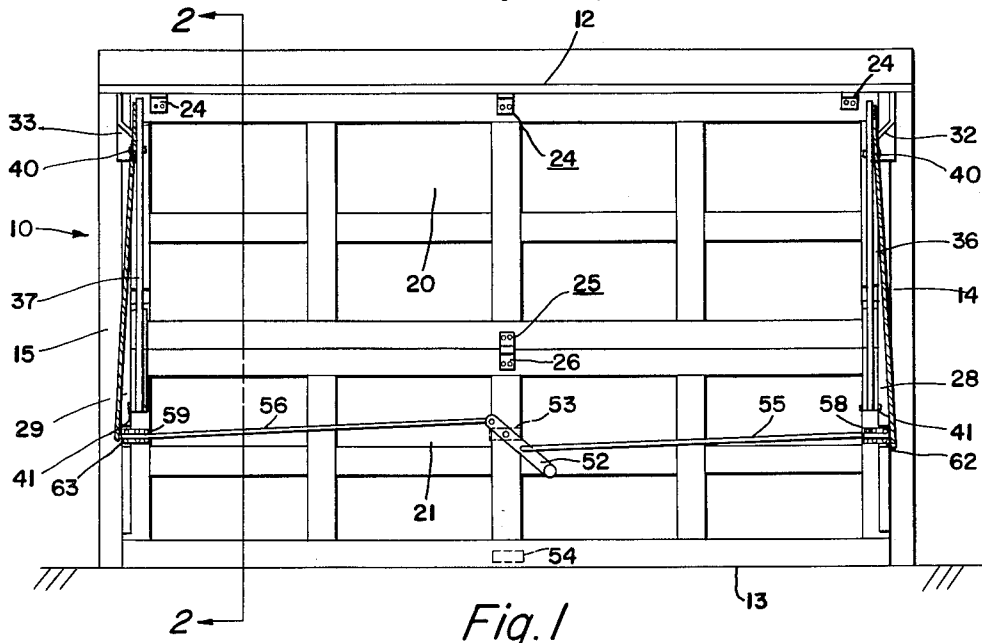


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INVENTOR.
Richard D. Houk
BY Woodling, Krost,
Changer and Rust
ATTORNEYS

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DOOR

Richard D. Houk, Alliance, Ohio, assignor to Consolidated Electronics Industries Corporation, a corporation of Delaware

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The present invention relates in general to upward opening doors and more particularly relates to an upward acting garage door.

Garage doors of the upward acting type have become increasingly popular and in the last ten to twenty years have far exceeded the use of horizontally swinging garage doors.

Many types of upward acting garage doors have been sold and still more types have been devised. The basic factors for the popularity of upward acting garage doors has been that the door lifts upwardly out of any snow which may be on the ground and thus the annoyance of having snow impede the movement of outwardly swinging garage doors is avoided. A single panel type of door which swings initially outwardly at the bottom and inwardly at the top into the inside of the garage has been popular in some cases, primarily in the Western part of the United States. Such a door has the disadvantages of requiring considerable room inside the garage for hardware such as pivot arms to control the upward and inward swinging movement of the door. Also, a considerable amount of head room above the door opening is required inside the garage and, still further, a considerable amount of room horizontally inwardly from the top of the door is required within the garage in order to accommodate the door in the open position. This type of door has the advantage of economy of construction, being only a single slab or panel and has fairly good economy of hardware. It has the additional disadvantage of requiring a fairly large opening of about $\frac{3}{4}$ " all the way around the door on the two sides and the top, and no door stop can be provided because the door swings both partially inwardly and partially outwardly. Thus, this Western type of door is unsatisfactory in the colder climates where snow would drift in around the large opening around the door. The slight outward movement of the door at the bottom during opening movement means it would have to push some snow out of the way and would also drag some snow down under the door during closing. Also, the initial outward opening door movement at the bottom makes an awkward door to lift, one which easily hits a person in the shins.

The aforementioned disadvantages of the single panel door have accounted for the progressively increasing popularity of the overhead sectional door, for example, four sections or panels which move upwardly and inside the garage on track guided rollers. The popularity of such door is increasing despite the fact that the completely assembled and installed door is about three times as expensive as the single panel western type door. The added expense of the overhead sectional door is caused by the expense of the increased amount and complexity of hardware including the two L-shaped tracks, the then rollers for a four section door, the many hinges, the counterbalance springs and the complexity of construction and installing four panels instead of one. Nevertheless, this door has the advantage of lifting directly upwardly out of any snow for easy opening and also moving slightly inwardly away from outside mounted door stops to minimize frictional drag against the door stops. The sectional door also has the disadvantage of requiring a fair amount of head room above the door frame header, for example about one foot to 18", and also requiring a large amount of space within

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the garage inwardly of the door frame header along the ceiling to accommodate the door in the open position.

Accordingly, it is an object of the present invention to provide an upward acting door of two panels with the complete door retaining the advantages of a single panel or sectional upward acting door to easily clear any snow on the ground and also to have the advantages of door stops for a tight fitting door in the door frame opening.

An object of the present invention is to provide an upward opening garage door which includes upper and lower panels which fold together in their open position to form a canopy over the outside of the door opening.

Another object of the present invention is to provide an upward opening door which includes upper and lower panels and motion directing means acting on the door panels which causes the lower panel to move outwardly away from the door frame upon opening movement of the door.

Another object of the present invention is to provide a door which includes at least upper and lower panels wherein the lower edge of the lower panel upon its initial opening movement moves slightly inwardly and upwardly so as to avoid snow or similar material which may be against the lower edge of the lower panel.

Another object of the present invention is to provide a door which because of its opening movement requires little or no head room or interior room within the enclosure with which it forms a closure.

Another object of the present invention is to provide an upwardly opening door which includes upper and lower panels and linkage means supporting a majority of the door weight whereby a person opening the door need lift no more than forty percent of the total weight of the door.

Another object of the present invention is to provide an upwardly opening door which includes upper and lower door panels wherein the upper panel moves substantially 90° between open and closed positions and the lower door panel moves substantially 180° relative to the upper door panel in moving between open and closed positions.

Another object of the present invention is to provide an upwardly opening door which includes at least upper and lower door panels with motion directing and linkage means whereby the door panels in their completely open position are locked in this position.

Another object of the present invention is to provide an upwardly opening door which includes at least first and second door panels with the sole support means of the door relative to the door frame constituting the swingable connecting of the upper door panel to the door header and a jamb bracket at the top fifteen percent of the door jamb.

Another object of the present invention is to provide an upwardly opening door which includes door stops between the door and the inside of an enclosure for which the door is a closure whereby wind blowing against the door merely serves to more tightly seal the door to the door frame.

Another object of the present invention is to provide an upwardly opening door which does not drag or rub against the door stops in its opening and closing movement.

Another object of the present invention is to provide an upwardly opening door which includes upper and lower panels where the lower panel is in the order of five to twenty percent shorter than the upper panel.

Another object of the present invention is to provide an upwardly opening door which does away with the necessity of utilizing tracks and rollers in moving the door between open and closed positions.

Another object of the present invention is to provide an upwardly opening door which has an upper panel swingably connected to a door header and a lower panel swing-

ably connected to the upper panel and a control arm pivotally connected at one end to the door jamb and pivotally connected at the other end to the lower door panel.

Other objects and a fuller understanding of this invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is an elevational view of the door of the present invention taken from inside the enclosure, in this instance a garage for which it is a closure; and

FIGURE 2 is a slightly enlarged sectional view taken on line 2—2 of FIGURE 1.

The door of the present invention has been indicated generally by the reference numeral 10 and in the embodiment shown herein it will be described as a garage door. The door frame opening to the garage which is closed by the door is defined by a header or upper wall 12, a floor or lower wall 13, and first and second jamb members 14 and 15 respectively, sometimes referred to as first and second side walls. The door 10 includes in combination upper and lower door panels 20 and 21 respectively, each of which has upper and lower edges, not numbered. First means 24 for hinging or swingably mounting the upper part or edge of the upper door panel 20 to the header 12 are provided and this first means is in the form of plural hinges, shown as three hinges, one at either side of the upper panel and one substantially in the middle of the upper panel. It will be noted from FIGURE 2 that the pivot point of the first hinge means 24 is immediately adjacent the header and is located at the outside face of the garage door.

Second means 25 are provided for hinging or swingably mounting the upper part or edge of the lower panel to the lower part or edge of the upper panel. The second means in this embodiment assumes the form of three hinges located below the three hinges of the first means 24, however, the pivot point of the second hinge means is located substantially at the inner face of the garage door. The second means includes a middle hinge 26 and side hinges 27. FIGURE 2 shows the door 10 in open position, and shows a closed position 10A as well as an intermediate position 10B in phantom.

First and second door stop members 28 and 29 are secured to the first and second jambs 14 and 15 respectively by suitable means such as nails. As will be noted from the drawings, these door stop members are located between the door and the interior of the garage and serve to limit the closing movement of the door. It will also be noted that the upper door panel is in the order of five to twenty percent longer than the lower door panel. A lower end 30 of the door stops terminates a short distance above floor 13, for example about six inches for a seven foot high door.

First and second jamb brackets 32 and 33 preferably of a metal construction are secured to the first and second jambs 14 and 15, respectively, as by lag screws, not shown. First and second control arms 36 and 37 form motion directing means and each has a first end portion which is secured to an inwardly offset portion of a respective jamb bracket 32 and 33 by means of first pivot means 40 which provides a first pivot point. The second end portion of the control arms 36 and 37 are secured to respective sides of the lower door panel by second pivot means 41 which serve to define a second pivot point. The second pivot means which connect the second end portions of the control arms to the lower door panel as will be noted are secured to an extension of the side hinges 27 of the second hinging means 25 which swingably connect the lower door panel to the upper door panel. This provides a solid linkage means between the second hinge point and the second pivot means 41 for a predetermined distance therebetween. It will be noted from FIGURE 2 that the first pivot means 40 fixes the first end portion of the control arms relative to the door jamb member a given distance

below and approximately said given distance inwardly of a vertical line from the first swingably mounting means 24. The pivot point of the second swingably mounting means 25 and the second pivot means 41 are also separated approximately the referred to given distance.

An extension 45 is provided on each of the first and second control arms 36 and 37 and counterbalance tension springs 47 may optionally be employed secured between the end of extensions 45 and a lower point 50 on the door jambs.

Means for latching and unlatching the garage door are provided including an inner and outer rotatable handle 52 and 53 respectively, on the lower door panel located generally centrally of the two sides of the door. Secured to and extending from the inner handle 52 are cables or rods 55 and 56 the respective ends of which are secured to spring biased latch members 58 and 59. The door jambs 14 and 15 respectively mount latch plates 62 and 63 into which latch members 58 and 59 are normally urged. Rotation of either the inner or outer handle serves to overcome the bias of the spring associated with the latch members to release the latch which permits the door to be moved to its open position. As soon as the door is unlatched as described, the door is opened by exerting a generally outwardly and upwardly directed force which causes the door panels to travel upwardly and outwardly in a generally folding manner to the open position as shown in FIGURE 2. This movement may be aided by the counterbalance springs 47, if employed. The initial opening movement of the door causes the lower edge of the lower door panel to move slightly inwardly and at the same time upwardly with respect to the door jamb causing this lower edge to avoid any foreign material lying against the same, such as snow or the like. The same path only in reverse is taken by the door upon closing movement of the same. In the open position of the door, it will be noted that the second pivot means 41 lies above a line extending between the first and second hinge means 24 and 25. This construction in effect locks the door in the up position or in other words a force acting upon the upper door panel tending to push the door closed will not close it, since it is resisted by the control arms 37 and 38, which effectively form supporting triangular braces. The weight of the upper panel 20 acts downwardly on the second hinge means 25, but the triangle formed by pivots 40 and 41 and second hinge 25 is thus forced to become distorted more toward a right triangle and supplies an upward force on pivot 41. Since the lower panel 21 can swing upwardly no further, this locks the door 10 in the open position. Even a person hanging on the outer edge at the hinge 25 cannot close the door. In order to cause closing movement of the door it is necessary to grasp the outer handle 53 or preferably an outer lower handle 54, and exert a downward pull on the lower door panel tending to move the same about the second hinge means 25. If the geometry of the linkage is changed so that the second pivot point 41 does not rise to as high an elevation as that shown, then the door 10 may not lock in the open position, and this may be desirable, especially if the counter-balancing springs 47 are used.

It will thus be seen that a door, and more particularly a garage door, has been provided wherein the upper and lower panels in their open position form a canopy over the outside of a garage door opening. Also because of the motion directing means in cooperation with the upper and lower door panels causes the lower panel upon opening movement to move outwardly and upwardly away from the door frame. The initial opening movement of the lower edge of the lower door panel is slightly inwardly and upwardly to avoid foreign material which may be lying thereagainst. It will also be seen from reviewing the drawings that the position of the garage ceiling 65 is such that the door and mechanism of the present invention requires little or no head room within the garage. The construction of the upper and lower door panels in

cooperation with the control arm provides a door which even in the absence of the counterbalance springs 47 requires a force of not more than forty percent of the total weight of the door to open the same. The movement of the upper and lower door panels to open position causes the upper panel to move through approximately 90° and the lower door panel moves substantially 180° relative to the upper door panel. It is also seen that the present door construction is such that in the open position the door is effectively locked against falling to closed position and the swingable mounting of the upper panel to the door header and the connection of the control arms between the door and the top fifteen percent of the door jamb constitutes substantially the sole means of supporting the door. The present construction conveniently does away with the need for tracks and rollers and with the door stops located between the door and the inside of the enclosure, wind blowing against the outside of the door merely serves to more tightly seal the door opening. The opening movement of the door as described, does away with the generally sliding or rubbing contact between the door panels and the door stops.

The second hinge means 25 provides in one unitary structure the hinge to hinge together the upper and lower panels 20 and 21 and also precisely positions the second pivot means 41 relative to the pivot of the second hinge means 25. Also, the jamb brackets 32 and 33, since they are mounted at the very top of the side jambs 15 and 16, precisely position the first pivot means 40 relative to the first hinge means 24. This forms a quadrilateral arrangement which is something like a parallelogram arrangement as best seen in the intermediate position 103 of FIGURE 2. This quadrilateral of pivot points is that which controls the opening and closing movement of the lower panel 21 relative to the upper panel 20. It will be observed that as the upper panel swings outwardly through approximately 90°, the lower panel 21 swings through an arc of about 180° relative to the upper panel 20. Thus, the lower panel 21 folds and collapses upwardly toward and substantially against the upper panel 20. With this movement of the door precisely controlled by the definitely mutually determined relationship of the four pivot points 24, 25, 40 and 41, the actual length of the lower panel 21 becomes clearly not critical. Thus, the lower panel may be easily trimmed at the site to fit the height of the door frame. Additionally, the door panels 20 and 21 are simple panels to construct and thus may readily be constructed in the field by ordinary carpenter labor as distinguished from specialized carpenter labor or mill work in the factory. Thus, the necessity to fabricate panels to close dimensions at a mill or factory is eliminated and also eliminated is the necessity for shipping such large panels from the factory to the building site. Ordinary framing members and exterior plywood panels, readily available everywhere, may be used at the building site to fabricate the panels 20 and 21. The simple hardware may be readily installed on the door frame and the door stops 28 and 29 may be mounted to provide a support for the door panels. The door panels may be stood in position for fitting, and the bottom of the lower panel 21 may then be trimmed as necessary to fit the door frame. The jamb brackets 32 and 33 are small and compact and are mounted at the top fifteen percent of the jambs and thus practically no head room or interior room within the garage is required horizontally inwardly from the header 12. This is in contradistinction to sectional overhead doors which require 8-10 feet inside the garage as well as 6-18 inches vertical head room inside the garage above the bottom of the door header 12.

As best observed in FIGURE 2, in the door closed position, the first hinge means 24 effectively supports the entire weight of the upper panel 20 and the jamb brackets and control arms plus the upper panel 20 effectively support the entire weight of the lower panel 21. Because of this support of the entire weight of the door panels, only

a very slight outward pull at the center and slight lifting force is necessary to start the opening movement of the door. The maximum lifting force is found to be when the door is in its intermediate position 10B, FIGURE 2, and the pull required decreases as the door reaches the full open position. In one particular example of a double size garage door which weighed 420 lbs., a maximum of only 140 lbs. lifting force was required on the door. This was in the intermediate range of position generally as shown at position 10B. In the event the geometry is modified so that the door does not lock full open, as by making pivot point 41 below a line joining the hinge means 24 and 25, then the counterbalance springs 47 will hold the door open. Only a small lifting force in the nature of 20-40 lbs., as by the counterbalance springs 47, is required to hold the door in the full open position. In another example of a door constructed in accordance with the invention, the door panels weighed a total of 385 lbs. and yet the total maximum lifting force required at any point in the door opening or closing movement was 110 lbs. This is less than thirty percent of the total weight of the doors and, hence, more than seventy percent of the weight of the door panels was always carried by the support and control means, namely, the hinge means 24 and first pivot means 40. Thus, the control arms and the mounting thereof which may be considered motion directing means for the door 20 is so designed that a majority of the weight of the door is always carried by the support and control means and, hence, a person plus the counterbalance means is never required to lift more than fifty percent of the weight of the door panels and, in actual practice, the lifting force may be as low as thirty or forty percent.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. In combination, an upward acting door for a door frame,
 - said door including upper and lower panels,
 - first means connecting the upper panel near the upper edge thereof for swinging movements relative to the upper part of a door frame,
 - second means effectively hinging the upper part of the lower panel to the lower part of the upper panel,
 - a frame bracket at the top fifteen percent of said door frame,
 - a control link pivoted to said lower panel and to said door frame bracket and swinging to lie between said upper and lower panels to establish substantially 180 degrees movement of the lower panel relative to the upper panel during substantially 90 degrees swinging movement of the upper panel to the door open position,
 - and said frame bracket and control link together with said first connecting means constituting the sole guide and support means of the door relative to the door frame.
2. A door for a door frame including, in combination,
 - at least upper and lower door panels,
 - means for swingably mounting an upper portion of said upper door panel to the upper portion of a door frame,
 - means for swingably connecting said lower door panel to said upper door panel,
 - a rigid door arm having first and second end portions,
 - a first pivot member connecting said first end portion of said door arm to the door frame,
 - a second pivot member connecting said second end portion of said door arm to said lower door panel,

said rigid door arm swinging to lie between and substantially parallel to said upper and lower door panels as said panels collapse together at the open position of said door.

3. In combination, an upward acting door for a door frame,
 - said door including upper and lower panels,
 - first means connecting the upper panel near the upper edge thereof for outward swinging movements relative to the upper part of a door frame,
 - means effectively hinging the upper part of the lower panel to the lower part of the upper panel,
 - a control arm having first and second ends,
 - first means pivoting the first end of said control arm fixed relative to the door frame at a location below and inwardly of the line of said first connecting means,
 - second means providing a pivotal connection between the second end of said control arm and said lower panel at a point below said hinge means to cause said lower panel to substantially collapse upwardly toward the inner surface of said upper panel as the upper panel is swung outwardly to a generally horizontal door open position,
 - and the door open position being established by said second pivot means at a level above a line joining said first pivot means and said hinge means such that the weight of said panels acts downwardly on said hinge means and forces said second pivot means and said lower panel upwardly against said upper panel to lock said door in the open position without aid from any counterbalance means.
4. In combination, an upward acting door for a door frame having a header and side jamb members,
 - said door including upper and lower panels,
 - first means connecting the upper panel near the upper edge thereof for outward swinging movements relative to the door frame header,
 - second means effectively hinging the upper part of the lower panel to the lower part of the upper panel,
 - a control arm having first and second ends,
 - means pivoting the first end of said control arm fixed relative to the door frame jamb member at a location a given distance below and approximately said given distance inwardly of the line of said first connecting means,
 - means providing a pivotal connection between the second end of said control arm and said lower panel at a point approximately said given distance below said second hinge means to cause said lower panel to substantially collapse upwardly toward the inner surface of said upper panel as the upper panel is swung outwardly to a generally horizontal door open position,
 - door stops fastened on said side jamb members disposed inwardly of the door,
 - and means including the vertical dimension of said lower panel being less than the vertical dimension of said upper panel plus said first swinging means and said control arm to assure that said lower panel moves outwardly from said door stops at substantially all points of movement in the opening and closing of said door.
5. In combination, an upward acting door for a door frame,
 - said door including upper and lower panels,
 - first means connecting the upper panel near the upper edge thereof for outward swinging movements relative to the upper part of a door frame,
 - second means effectively hinging the upper part of the lower panel to the lower part of the upper panel,
 - a control arm having first and second ends,
 - first means pivoting the first end of said control arm fixed relative to the door frame at a location below

- and inwardly of the line of said first connecting means,
- means providing a pivotal connection between the second end of said control arm and said lower panel at a point below said second hinge means to cause said lower panel to substantially collapse upwardly toward the inner surface of said upper panel as the upper panel is swung outwardly to a generally horizontal door open position,
- and means including said first connecting means and said control arm and including the positioning of said first pivot means to establish movement of the lower edge of the lower panel slightly inwardly of the door frame opening upon initial opening movement of the door to thus clear any snow or the like on the outside of the door.
6. In combination, an upward acting door for a door frame,
 - said door including upper and lower panels,
 - first means connecting the upper panel near the upper edge thereof for outward swinging movements relative to the upper part of a door frame,
 - means effectively hinging the upper part of the lower panel to the lower part of the upper panel,
 - a control arm having first and second ends,
 - means pivoting the first end of said control arm fixed relative to the door frame at a location below and inwardly of the line of said first connecting means,
 - means providing a pivotal connection between the second end of said control arm and said lower panel at a point below said second hinge means to cause said lower panel to substantially collapse upwardly toward the inner surface of said upper panel as the upper panel is swung outwardly to a generally horizontal door open position,
 - and solid linkage means between said hinge means and said pivotal connection of the second end of said control arm on said lower panel to thus positively establish the distance therebetween to thus positively control the collapsing movement of said lower panel upwardly toward said upper panel in the door opening movement thus permitting ready variation in the vertical height of said lower panel to fit various heights of door frame openings.
7. A door for a door frame opening having a header and side jamb members comprising, in combination, upper and lower panels each having upper and lower edges,
 - first means hinging the upper edge of the upper panel to the door frame header,
 - second means hinging together the upper and lower panels on a generally horizontal line at the upper edge of the lower panel and the lower edge of the upper panel,
 - a jamb bracket fixedly attached to each frame jamb member,
 - a first pivot point on each of said brackets a given distance below and substantially said given distance inwardly of the axis of said first hinge means,
 - a control arm pivoted to each said first pivot point,
 - each said control arm having an outboard end pivoted to said lower panel at a second pivot point substantially said given distance below said second hinge means,
 - said upper panel being hinged to swing outwardly and upwardly at said first hinge means to form a canopy over said door frame opening in the open position and with said second panel collapsed substantially upwardly against the inside of said upper panel,
 - said control arms being disposed generally parallel to and between said panels with said door in the open position,
 - and said control arms being constructed and arranged to control movement of said lower panel upon outward and upward swinging movements of said upper

panel to establish controlled movement of said lower
panel for said collapsing movement of said lower
panel relative to said upper panel and said upper
panel being in the order of five to twenty percent
longer than said lower panel, whereby no part of
said lower panel extends inside the garage when the
door is open.

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HARRISON R. MOSELEY, *Primary Examiner.*